

$$s_{1,i,j} = \mathbb{1}\{i \neq j\} \max(0, \Delta - x_i y_i + x_i y_j)$$

$$s_{2,i,j} = \mathbb{1}\{i \neq j\} \max(0, \Delta - x_i y_i + x_j y_i)$$

$$J(\theta)_i = \sum_j s_{1,i,j} + s_{2,i,j}$$

$$\frac{\partial J(\theta)}{\partial x_i} = \sum_{j \neq i} (y_j - y_i)(s_{1,i,j} > 0) - \sum_{j \neq i} (y_i)(s_{2,i,j} > 0) + \sum_{j \neq i} y_j(s_{2,j,i} > 0)$$

$$\frac{\partial J(\theta)}{\partial y_i} = \sum_{j \neq i} (x_j - x_i)(s_{2,i,j} > 0) - \sum_{j \neq i} (x_i)(s_{1,i,j} > 0) + \sum_{j \neq i} x_j(s_{1,j,i} > 0)$$